

### **Amendments to the Specification:**

**Please amend the paragraph starting at column 1 line 46 as follows:**

A conventional form of post-modulation pulse shaping to minimize spectral bandwidth utilizes some form of ~~Nyquist-a-type~~ Nyquist-type filtration, such as Nyquist, root-Nyquist, raised cosine-rolloff etc. Nyquist-type filters are desirable as they provide a nearly ideal spectrally constrained waveform and negligible inter-symbol interference. This is achieved by spreading the datum for a single constellation phase point over many unit intervals in such a manner that the energy from any given phase-point datum does not interfere with the energy from preceding and following phase-point data at the appropriate interval sampling instants.

**Please amend the paragraph starting at column 5 line 24 as follows:**

Each phase point 54 in constellation 46 represents a plurality, in this example four, of symbols or to-be-communicated bits. The values of the ~~symbols~~ symbols in a given phase point 54 determine the location of that phase point 54 within constellation 46 in a manner well known to those skilled in the art.

**Please amend the paragraph starting at column 6 line 4 as follows:**

FIGs. 3 and 4 illustrate a series of twelve exemplary sequential phase points 52, representative of a random data stream processed by transmitter circuit 22 (FIG.2). These twelve exemplary phase points 52 reside at temporally consecutive locations labeled  $t_0$ ,  $t_1$ ,  $t_2$ ,  $t_3$ ,  $t_4$ ,  $t_5$ ,  $t_6$ ,  $t_7$ ,  $t_8$ ,  $t_9$ ,  $t_{10}$ , and  $t_{11}$ . These labels represent sequential integral times at unit intervals 64, i.e., integral-baud times, and indicate the

leading-edge times of phase-point pulses 66. For purposes of simplification within this discussion, any occurrence at time  $t_N$  shall be referred to as "occurrence  $t_N$ ". For example, an exemplary phase point 52 occurring at time  $t_2$  shall be referred to as phase point  $t_2$ , and the associated phase-point pulse 66 whose leading edge occurs at time  $t_2$  shall be referred to as phase-point-signal pulse  $t_2$ . In other words, at time  $t_2$ , phase ~~point  $t_2$~~ , point  $t_2$  is clocked and phase-point-signal pulse  $t_2$  begins. One unit interval 64 later, at time  $t_3$ , phase point  $t_3$  is clocked and phase-point pulse  $t_3$  begins. This process continues indefinitely, with twelve exemplary phase points  $t_0$  through  $t_{11}$  depicted in FIG. 3 and twelve corresponding phase-point-signal pulses  $t_0$  through  $t_{11}$  depicted in phase-point signal stream 50 of FIG. 4.

**Please amend the paragraph starting at column 8 line 15 as follows:**

The generation of off-time phase points 92 approximately midway in time between consecutive on-time phase points 90 causes filtered signal locus 72 to effect excursions having local peak magnitudes 99 greater than outer-ring magnitude 68. Such excursions occur because the immediate position of locus 72 at any given instant in time is not only a result of those phase points 54 proximate that position, but of a plurality of phase points 54 both preceding and following that instant in time. That is, in this preferred embodiment, the determination of the position of locus 72 at time  $t_{2.5}$  (i.e., coincident with off-time phase point  $t_{2.5}$ ) is determined not only by the positions of phase points  $t_2$  and  $t_3$ , but by the positions of numerous phase points 54 preceding phase ~~point  $t_{2.5}$~~ , point  $t_{2.5}$  (i.e., phase points  $t_2$ ,  $t_{1.5}$ ,  $t_1$ ,

$t_{0.5}$ , etc.) and the positions of numerous phase points 54 following phase point  $t_{2.5}$  (i.e., phase points  $t_3$ ,  $t_{3.5}$ ,  $t_4$ ,  $t_{4.5}$ , etc.).

**Please amend the paragraph starting at column 9 line 1 as follows:**

The value of locus 72 at any instant in time between integral-baud times is the sum of the values of all datum bursts 100 at that instant. For example, in FIG. 6 where only two datum bursts 100 are considered, locus 72 has a value at time  $t_{2.5}$  that is the sum of the values of datum bursts  $t_2$  and  $t_3$  at ~~time  $t_{2.5}$~~  time  $t_{2.5}$ . Since datum bursts  $t_2$  and  $t_3$  both have significant positive values at time  $t_{2.5}$ , locus 72 has a value significantly greater than the maximum values of either datum burst  $t_2$  or datum burst  $t_3$ .

**Please amend the paragraph starting at column 10 line 11 as follows:**

Threshold signal 120 and off-time signal stream 86 are combined in an off-time complex summing or combining circuit 122 to produce an off-time difference signal stream 124. Off-time difference signal stream 124 is made up of a series of off-time difference pulses 126 whose values are the difference between the values of equivalent off-time ~~pulses 82~~ pulses 82 and the value of threshold signal 120. Since any given off-time pulse 82 may have a value greater than, equal to, or less than the value of threshold signal 120, off-time difference signal stream 124 would normally be made up of a combination of off-time difference pulses 126 having positive, zero, and negative values.

**Please amend the paragraph starting at column 10 line 40 as follows:**

Off-time error signal stream 130 is then passed to the input of an off-time pulse-spreading filter 134. Off-time pulse-

spreading filter 134 is desirably substantially identical to first pulse-spreading filter 76. That is, in this preferred embodiment, both pulse-spreading filters 76 and 134 are realized as Nyquist-type filters with substantially identical transfer characteristics. However, in other applications, such as an OFDM application, non-identical pulse-spreading filters 76 and 134 may ~~be~~ be advantageous. Off-time pulse-spreading filter 134 produces off-time constrained-bandwidth error signal stream 108 and completes the action of off-time constrained-envelope generator 106.

**Please amend the paragraph starting at column 10 line 52 as follows:**

Like pulse-spreading filter 76, pulse-spreading filter 134 is configured to achieve spectral containment goals. Essentially, pulse-spreading filter 134 spreads the energy from each off-time error pulse 132 in time over many unit intervals 64 so that substantially all energy from each off-time error pulse 132 remains confined within the desired bandwidth, normally substantially the same bandwidth for which pulse-spreading filter 76 is designed. The resulting constrained-bandwidth error signal stream 108 thus represents the sum, at each unit interval 64, of portions of several off-time error pulses 132 whose energy has been spread out in time over several unit intervals 64. No harm to spectral containment would result if off-time constrained-bandwidth error signal stream 108 were to exhibit a more narrow bandwidth than modulated signal 74. However, increasing harm to spectral containment results as off-time constrained-bandwidth error signal ~~stream~~ stream 108 exhibits an increasingly wider bandwidth than modulated signal 74. Thus, off-time constrained-bandwidth error signal stream 108 desirably exhibits a bandwidth

substantially equal to or less than the bandwidth exhibited by modulated signal 74.

**Please amend the paragraph starting at column 11 line 6 as follows:**

Within off-time constrained-envelope generator 106, off-time pulse-spreading filter 134 receives one off-time error pulse 132 from off-time discriminator 128 for each peaking unit interval 133. Off-time pulse-spreading filter 134 then transforms each off-time error pulse 132 into a Nyquist-type error burst 135, which has substantially the same shape as datum bursts 100 (FIG. 6). Each error burst 135 spreads energy over a plurality of unit intervals 64 and exhibits a ~~Delay element 138 delays modulated signal 74 so that peaks~~ peak in one unit interval 64. Peaks Delay element 138 delays modulated signal 74 so that peaks of error bursts 135 substantially temporally coincide with peaking unit intervals 133. Since off-time pulse-spreading filter 134 is a Nyquist-type filter, each error burst attains an error-burst peak value (not shown) at the primary sampling time of the specific off-time error pulse 132 (i.e., at time  $t_{2.5}$  for error pulse  $t_{2.5}$ ), and attains a zero error-burst value (not shown) at integral unit intervals 64 preceding and following the peak error-burst value (i.e., at times ...,  $t_{-1.5}$ ,  $t_{0.5}$ ,  $t_{1.5}$ , and  $t_{3.5}$ ,  $t_{4.5}$ ,  $t_{5.5}$ , ..., for error pulse  $t_{2.5}$ ). In this manner, the energy of each off-time constrained-envelope error pulse 136 is spread over a plurality of baud intervals 64 preceding and following the clocking instant (time  $t_{2.5}$ ). This results in the conversion of off-time error signal stream 130 into off-time constrained-bandwidth error signal stream 108. Off-time constrained-bandwidth error signal stream 108 is made up of off-time constrained-envelope error pulses 136. This operation is

essentially the same as the operation of pulse-spreading filter 76 in the conversion of phase-point signal stream 50 into modulated signal 74 described hereinabove.

**Please amend the paragraph starting at column 13 line 49 as follows:**

In another alternate embodiment which seeks to optimize performance, modulated signal 74 may be broken into more than the off-time and on-time signal streams 86 and 84 discussed above. In one example, four streams may provide samples for  $t_{N,00}$ ,  $t_{N,25}$ ,  $t_{N,50}$  and  $t_{N,75}$  instants of each unit interval, where N is a unit interval number. Interpolators (not shown) may be used to expand the off-time and on-time signal streams 86 and 84 into four streams. Each of the four streams may be processed through its own ~~constrained~~ constrained-envelop generator 106. As discussed above, the four error signal streams 130 may be scaled relative to each other through the addition of multiplying sections (not shown) upstream of pulse-spreading filters 134. In one embodiment, in order to reduce the amount of hardware needed to implement pulse-spreading filters 134, four streams are generated, but only two pulse-spreading filters 134 are used. In this embodiment, the relative scaling applied to off-time and on-time error signal streams 130 and 130' is dynamically adjusted on a unit interval by unit interval basis in response to where among the four streams a signal peak occurs. These and other changes and modifications to the above-described embodiments do not depart from the spirit of the invention.

**Please amend the paragraph starting at column 14 line 43 as follows:**

When communication system 20 (FIG. 1) is configured to ~~implements~~ implement a CDMA communication scheme, a similar